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CHI MEI OPTOELECTRONICS CORP.

Doc No.: 4407Z602
Issued Date: Jul, 02, 2008
Model No.: N121IB - L01
**Approval**

# TFT LCD Approval Specification

# MODEL NO.: N121IB - L01

Customer: _____

Approved by: _____

Note:

| 記錄 | 工作 | 審核 | 角色 | 投票 |
|---|---|---|---|---|
| 2008-07-14 19:48:29 CST | PMMD III Director | annie_hsu(徐凡琇/56522 / 54873) | Director | Accept |



**Version 2.0**

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# - CONTENTS -

REVISION HISTORY ---------- 3

1. GENERAL DESCRIPTION ---------- 4
   1.1 OVERVIEW
   1.2 FEATURES
   1.3 APPLICATION
   1.4 GENERAL SPECIFICATIONS
   1.5 MECHANICAL SPECIFICATIONS

2. ABSOLUTE MAXIMUM RATINGS ---------- 5
   2.1 ABSOLUTE RATINGS OF ENVIRONMENT
   2.2 ELECTRICAL ABSOLUTE RATINGS
      2.2.1 TFT LCD MODULE
      2.2.2 BACKLIGHT UNIT

3. ELECTRICAL CHARACTERISTICS ---------- 7
   3.1 TFT LCD MODULE
   3.2 BACKLIGHT UNIT

4. BLOCK DIAGRAM ---------- 10
   4.1 TFT LCD MODULE

5. INPUT TERMINAL PIN ASSIGNMENT ---------- 11
   5.1 TFT LCD MODULE
   5.2 TIMING DIAGRAM OF LVDS INPUT SIGNAL
   5.3 COLOR DATA INPUT ASSIGNMENT
   5.4 EDID DATA STRUCTURE

6. CONVERTER SPECIFICATION ---------- 錯誤! 尚未定義書籤。
   6.1 CONNECTOR TYPE
   6.2 INPUT CONNECTOR PIN ASSIGNMENT
   6.3 INPUT ELECTRICAL CHARACTERISTICS OF CONVERTER

7. INTERFACE TIMING ---------- 18
   INPUT SIGNAL TIMING SPECIFICATIONS
   7.2 POWER ON/OFF SEQUENCE

8. OPTICAL CHARACTERISTICS ---------- 20
   8.1 TEST CONDITIONS
   8.2 OPTICAL SPECIFICATIONS

9. PRECAUTIONS ---------- 24
   9.1 HANDLING PRECAUTIONS
   9.2 STORAGE PRECAUTIONS
   9.3 OPERATION PRECAUTIONS

10. PACKING ---------- 25
   10.1 CARTON
   10.2 PALLET

11. DEFINITION OF LABELS ---------- 27
   11.1 CMO MODULE LABEL
   11.2 CARTON LABEL



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## REVISION HISTORY

| Version | Date | Page (New) | Section | Description |
|---|---|---|---|---|
| Ver 2.0 | July. 02, '08 | All | All | Approval specification first issued. |

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# 1 GENERAL DESCRIPTION

## 1.1 OVERVIEW

N121IB-L01 is a 12.1" TFT Liquid Crystal Display module with LED Backlight unit and 20 pins LVDS interface. This module supports 1280 x 800 Wide-XGA mode and can display 262,144 colors. The optimum viewing angle is at 6 o'clock direction. The converter module for Backlight is built in.

## 1.2 FEATURES



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- Thin and light.
- WXGA (1280 x 800 pixels) resolution
- 3.3V LVDS (Low Voltage Differential Signaling) interface with 1 pixel/clock
- Meet RoHS requirement
- LED Backlight

### 1.3 APPLICATION

- TFT LCD Notebook

### 1.4 GENERAL SPECIFICATI0NS

| Item | Specification | Unit | Note |
|---|---|---|---|
| Active Area | 261.12 (H) x 163.2 (V) (12.1" diagonal) | mm | (1) |
| Bezel Opening Area | 263.67 (H) x 165.75 (V) | mm | |
| Driver Element | a-si TFT active matrix | - | - |
| Pixel Number | 1280 x R.G.B. x 800 | pixel | - |
| Pixel Pitch | 0.204 (H) x 0.204 (V) | mm | - |
| Pixel Arrangement | RGB vertical stripe | - | - |
| Display Colors | 262,144 | color | - |
| Transmissive Mode | Normally white | - | - |
| Surface Treatment | Hard coating (3H), Anti-glare type | - | - |

### 1.5 MECHANICAL SPECIFICATIONS

| Item | | Min. | Typ. | Max. | Unit | Note |
|---|---|---|---|---|---|---|
| Module Size | Horizontal(H) | 275.3 | 275.8 | 276.3 | mm | (1) |
| | Vertical(V) | 179 | 179.5 | 180 | mm | |
| | Depth(D) | - | 4.7 | 5.0 | mm | |
| Weight | | - | 215 | 230 | g | (2) |

Note (1) Please refer to the attached drawings for more information of front and back outline dimensions.

(2) Max weight including converter.

## 2 ABSOLUTE MAXIMUM RATINGS

### 2.1 ABSOLUTE RATINGS OF ENVIRONMENT

| Item | Symbol | Value | | Unit | Note |
|---|---|---|---|---|---|
| | | Min. | Max. | | |
| Storage Temperature | $T_{ST}$ | -20 | +60 | ºC | (1) |
| Operating Ambient Temperature | $T_{OP}$ | 0 | +50 | ºC | (1), (2) |
| Shock (Non-Operating) | $S_{NOP}$ | - | 200/2 | G/ms | (3), (5) |
| Vibration (Non-Operating) | $V_{NOP}$ | - | 1.5 | G | (4), (5) |

Note (1) (a) 90 %RH Max. (Ta ≦ 40 ºC).



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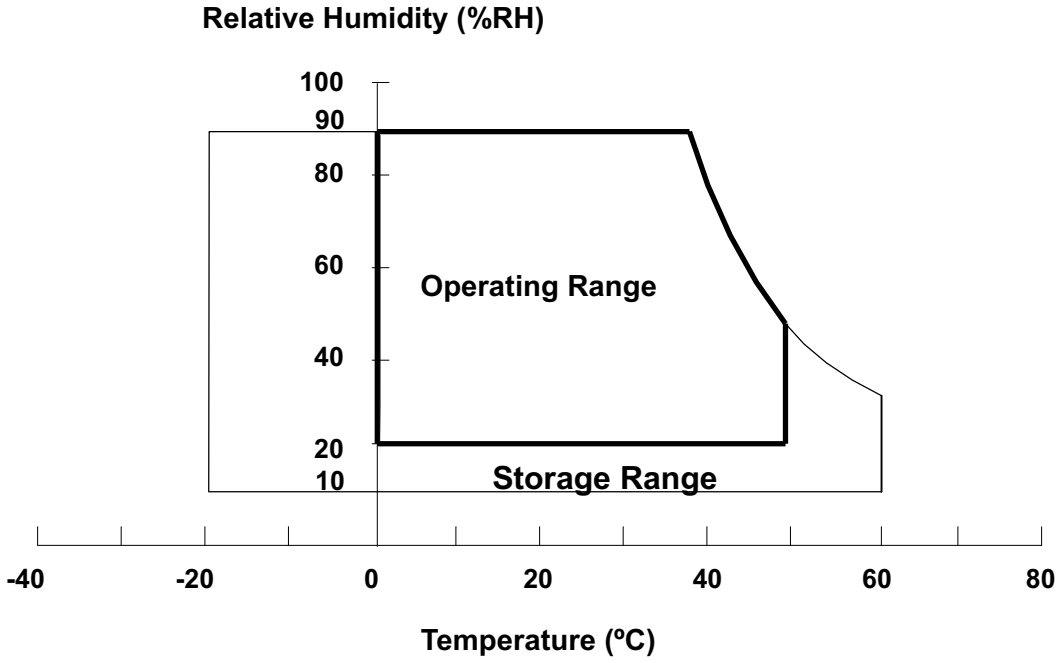
(b) Wet-bulb temperature should be 39 ºC Max. (Ta > 40 ºC).

(c) No condensation.

Note (2) The temperature of panel display surface area should be 0 ºC Min. and 60 ºC Max.

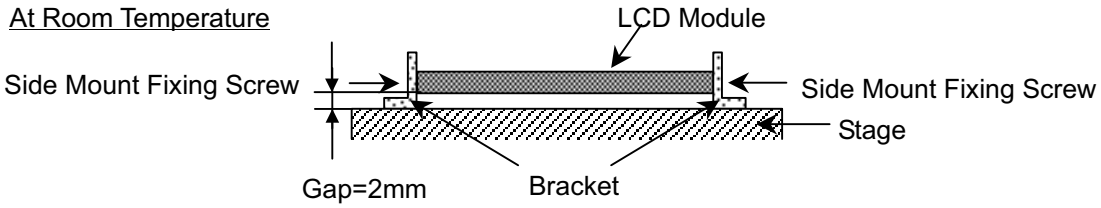



Note (3) 1 time for ± X, ± Y, ± Z. for Condition (200G / 2ms) is half Sine Wave,.

Note (4) 10 ~ 500 Hz, 30 min/cycle,1cycles for each X, Y, Z axis.

Note (5) At testing Vibration and Shock, the fixture in holding the module has to be hard and rigid enough so that the module would not be twisted or bent by the fixture.

The fixing condition is shown as below:




## 2.2 ELECTRICAL ABSOLUTE RATINGS

### 2.2.1 TFT LCD MODULE

| Item | Symbol | Value | | Unit | Note |
|---|---|---|---|---|---|
| | | Min. | Max. | | |
| Power Supply Voltage | Vcc | -0.3 | +4.0 | V | (1) |
| Logic Input Voltage | $V_{IN}$ | -0.3 | Vcc+0.3 | V | |

### 2.2.2 BACKLIGHT UNIT

| Item | Symbol | Value | Unit | Note |
|---|---|---|---|---|



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| | | Min. | Max. | | |
|---|---|---|---|---|---|
| LED Light Bar Power Supply Voltage | $V_L$ | 24.0 | 27.2 | V | (1), (2) |
| LED Light Bar Power Supply Current | $I_L$ | -- | 120 | mA | |

Note (1) Permanent damage to the device may occur if maximum values are exceeded. Function operation should be restricted to the conditions described under Normal Operating Conditions.

Note (2) Specified values are for LED (Refer to Section 3.2 for further information).

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# 3 ELECTRICAL CHARACTERISTICS

## 3.1 TFT LCD MODULE

| Parameter | | Symbol | Value | | | Unit | Note |
|---|---|---|---|---|---|---|---|
| | | | Min. | Typ. | Max. | | |
| Power Supply Voltage | | Vcc | 3.0 | 3.3 | 3.6 | V | - |
| Ripple Voltage | | $V_{RP}$ | - | | 100 | mV | - |
| Rush Current | | $I_{RUSH}$ | - | 1.2 | 1.5 | A | (2) |
| Initial Stage Current | | $I_{IS}$ | | | 1.0 | A | (2) |
| Power Supply Current | White | Icc | - | 270 | 300 | mA | (3)a |
| | Black | | - | 330 | 360 | mA | (3)b |



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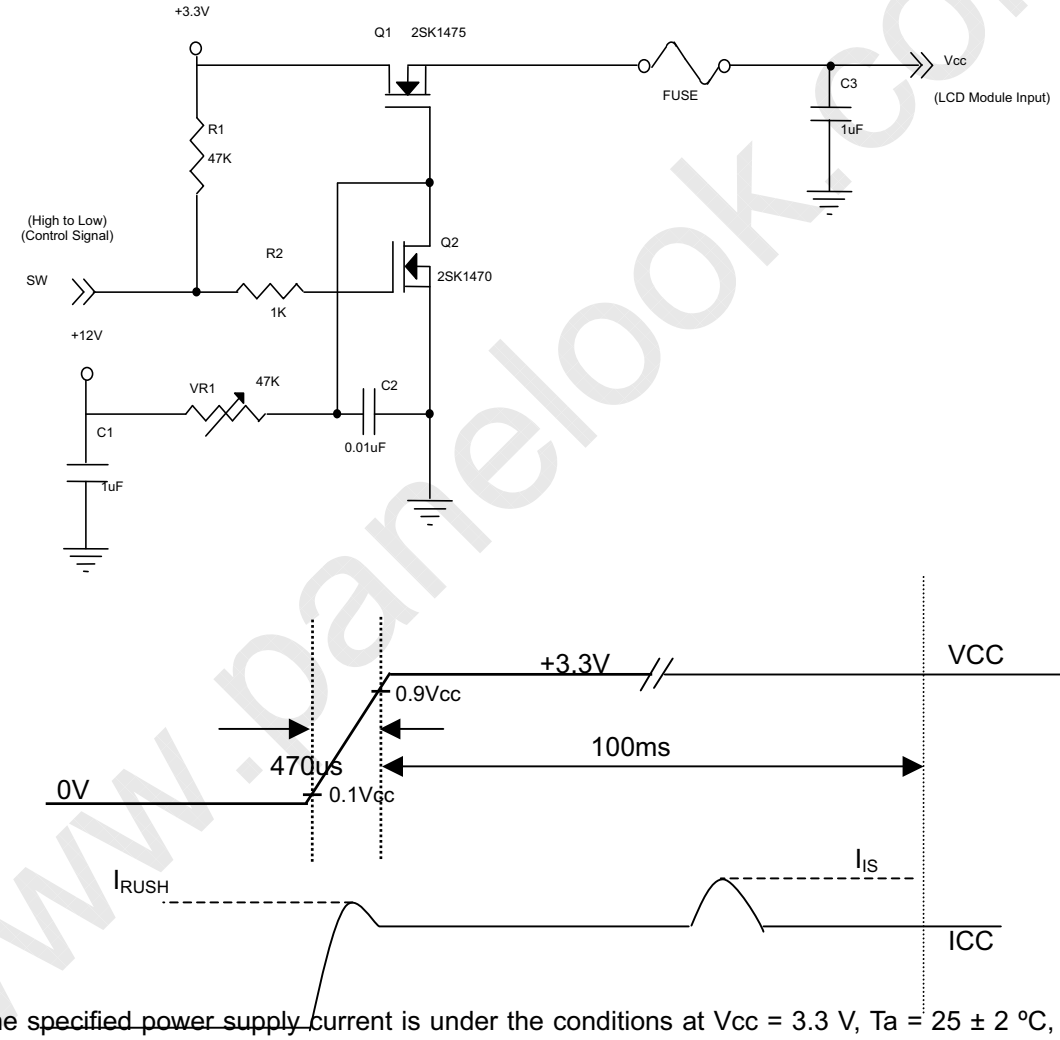
| | | | | | | |
|---|---|---|---|---|---|---|
| LVDS Differential Input High Threshold | $V_{TH(LVDS)}$ | | | +100 | mV | (5), $V_{CM}$=1.2V |
| LVDS Differential Input Low Threshold | $V_{TL(LVDS)}$ | -100 | | | mV | (5) $V_{CM}$=1.2V |
| LVDS Common Mode Voltage | $V_{CM}$ | 1.125 | | 1.375 | V | (5) |
| LVDS Differential Input Voltage | $\|V_{ID}\|$ | 100 | | 600 | mV | (5) |
| Terminating Resistor | $R_T$ | - | 100 | - | Ohm | - |
| Power per EBL WG | $P_{EBL}$ | - | (1.70) | | W | (4) |

Note (1) The ambient temperature is Ta = 25 ± 2 ºC.

Note (2) $I_{RUSH}$: the maximum current when VCC is rising

$I_{IS}$: the maximum current of the first 100ms after power-on

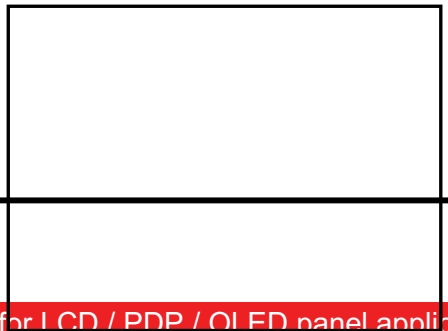
Measurement Conditions: Shown as the following figure. Test pattern: black.

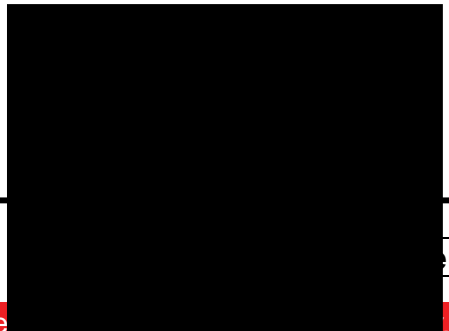



Note (3)The specified power supply current is under the conditions at Vcc = 3.3 V, Ta = 25 ± 2 ºC, $f_v$ = 60 Hz, whereas a power dissipation check pattern below is displayed.

a. White Pattern

b. Black Pattern







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Note (4) The specified power are the sum of LCD panel electronics input power and the converter input power. Test conditions are as follows.

(a) Vcc = 3.3 V, Ta = 25 ± 2 ºC, $f_v$ = 60 Hz,

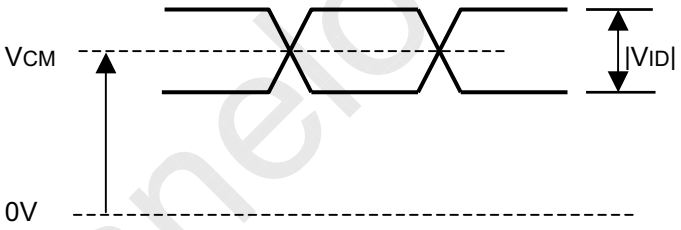
(b) The pattern used is a black and white 32 x 36 checkerboard, slide #100 from the VESA file "Flat Panel Display Monitor Setup Patterns", FPDMSU.ppt.

(c) Luminance: 60 nits.

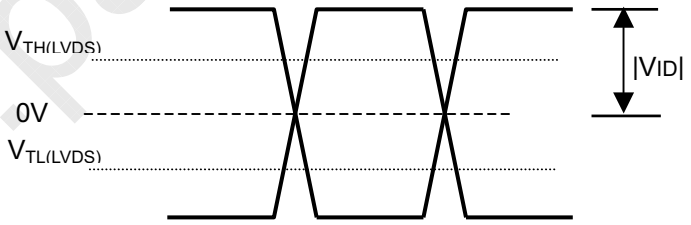
(d) The converter used is provided from Sumida(CMO converter P/N:27-D016392).

Note (5) The parameters of LVDS signals are defined as the following figures.

**Single Ended**




**Differential**




3.2 BACKLIGHT UNIT

Ta = 25 ± 2 ºC

| Parameter | Symbol | Value | | | Unit | Note |
|---|---|---|---|---|---|---|
| | | Min. | Typ. | Max. | | |
| LED Quantity | | | 48 | | Pcs | (1), |
| LED light bar Power Supply Voltage | $V_L$ | -- | 25.6 | 27.2 | $V_{dc}$ | (1), (2) |
| LED light bar Power Supply Current | $I_L$ | -- | 105 | 120 | mA | |
| LED Life Time | $L_{BL}$ | 12,000 | - | - | Hrs | (4) |
| Power Consumption | Po | -- | 2.68 | 3.26 | W | (3), $I_L$ = 105mA |



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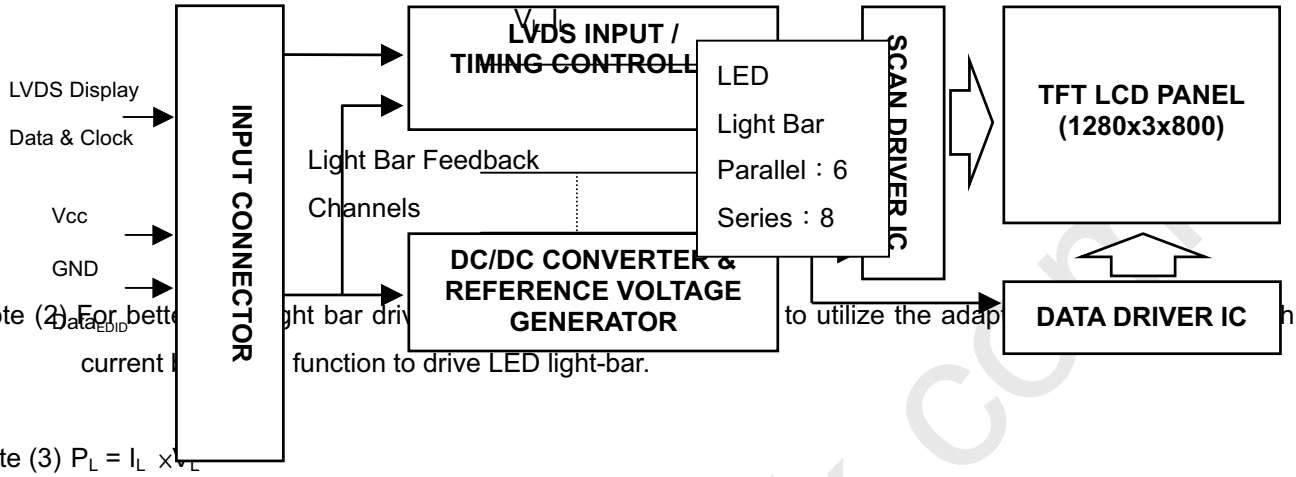
Note (1) LED light bar configuration is shown as below:




Note (2) For bette ght bar driv to utilize the adap h current I function to drive LED light-bar.

Note (3) $P_L = I_L \times V_L$

Note (3) The lifetime of LED is defined as the time when it continues to operate under the conditions at Ta = 25 ±2 °C and $I_L$ = 17.5 mA(Per EA) until the brightness becomes ≦ 50% of its original value.

## 4 BLOCK DIAGRAM

### 4.1 TFT LCD MODULE



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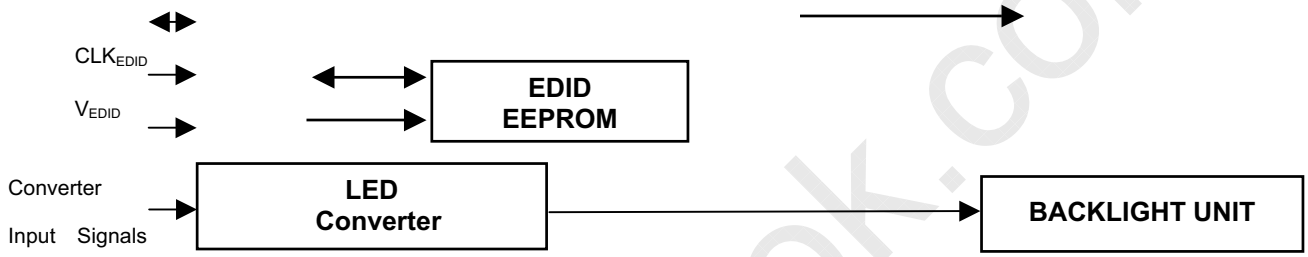


## 5 INPUT TERMINAL PIN ASSIGNMENT

### 5.1 TFT LCD MODULE

| Pin | Symbol | Description | Polarity | Remark |
|---|---|---|---|---|
| 1 | VSS | Ground | | - |
| 2 | VDD | Power Supply +3.3 V | | - |
| 3 | VDD | Power Supply +3.3 V | | - |
| 4 | $V_{EDID}$ | DDC +3.3 V | | |
| 5 | TEST | Panel Self Test | | |
| 6 | $CLK_{EDID}$ | DDC Clock | | |
| 7 | $Data_{EDID}$ | DDC Data | | |
| 8 | Rxin0- | LVDS Differential Data Input | Negative | R0~R5,G0- |
| 9 | Rxin0+ | LVDS Differential Data Input | Positive | |
| 10 | VSS | Ground | | |
| 11 | Rxin1- | LVDS Differential Data Input | Negative | |
| 12 | Rxin1+ | LVDS Differential Data Input | Positive | G1~G5,B0,B1 |
| 13 | VSS | Ground | | |
| 14 | Rxin2- | LVDS Differential Data Input | Negative | - |
| 15 | Rxin2+ | LVDS Differential Data Input | Positive | B2~B5,Hsync,Vsync,DE |
| 16 | VSS | Ground | | |
| 17 | CLK- | LVDS Clock Data Input | Negative | LVDS Level |
| 18 | CLK+ | LVDS Clock Data Input | Positive | |
| 19 | VSS | Ground | - | - |
| 20 | VSS | Ground | - | - |

Note (1) Connector Part No.: DF19KR-20P-1H or equivalent



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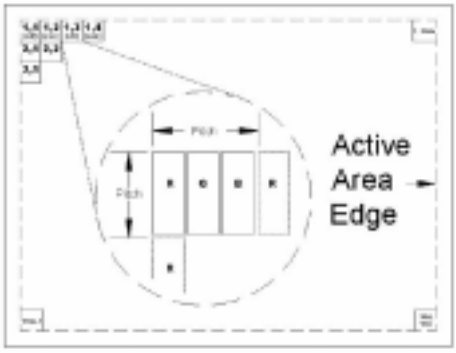
Note (2) User's connector Part No: DF19G-20S-1C or equivalent

Note (3) The first pixel is odd as shown in the following figure.

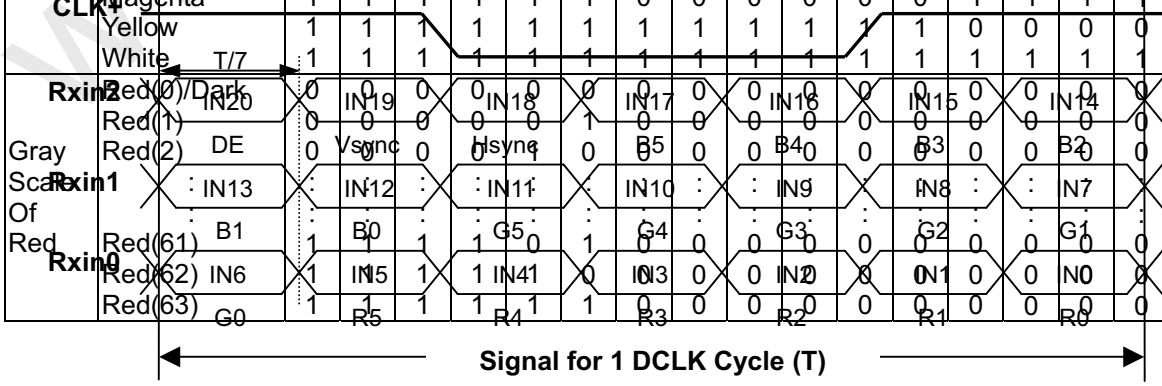



## 5.2 TIMING DIAGRAM OF LVDS INPUT SIGNAL

## 5.3 COLOR DATA INPUT ASSIGNMENT

The brightness of each primary color (red, green and blue) is based on the 6-bit gray scale data input for the color. The higher the binary input the brighter the color. The table below provides the assignment of color versus data input.

| Color | | Data Signal | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Red | | | | | | Green | | | | | | Blue | | | | | |
| | | R5 | R4 | R3 | R2 | R1 | R0 | G5 | G4 | G3 | G2 | G1 | G0 | B5 | B4 | B3 | B2 | B1 | B0 |
| Basic Colors | Black | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Red | 1 | 1 | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Green | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Blue | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | 1 | 1 |
| | Cyan | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| | Magenta | 1 | 1 | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | 1 | 1 |
| | Yellow | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 |
| | White | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| Gray Scale Of Red | Red(0)/Dark | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Red(1) | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Red(2) | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : |
| | Red(61) | 1 | 1 | 1 | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Red(62) | 1 | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Red(63) | 1 | 1 | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |



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| | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Green(0)/Dark | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Green(1) | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 |
| Gray | Green(2) | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Scale | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : |
| Of | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : |
| Green | Green(61) | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Green(62) | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Green(63) | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Blue(0)/Dark | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Blue(1) | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 |
| Gray | Blue(2) | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 |
| Scale | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : |
| Of | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : |
| Blue | Blue(61) | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | 0 | 1 |
| | Blue(62) | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | 1 | 0 |
| | Blue(63) | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | 1 | 1 |

Note (1) 0: Low Level Voltage, 1: High Level Voltage

## 5.4 EDID DATA STRUCTURE

The EDID (Extended Display Identification Data) data formats are to support displays as defined in the VESA Plug & Display and FPDI standards.

| Byte # (decimal) | Byte # (hex) | Field Name and Comments | Value (hex) | Value (binary) |
|---|---|---|---|---|
| 0 | 0 | Header | 00 | 00000000 |
| 1 | 1 | Header | FF | 11111111 |
| 2 | 2 | Header | FF | 11111111 |
| 3 | 3 | Header | FF | 11111111 |
| 4 | 4 | Header | FF | 11111111 |
| 5 | 5 | Header | FF | 11111111 |
| 6 | 6 | Header | FF | 11111111 |
| 7 | 7 | Header | 00 | 00000000 |
| 8 | 8 | EISA ID manufacturer name (“CMO”) | 0D | 00001101 |
| 9 | 9 | EISA ID manufacturer name (Compressed ASCII) | AF | 10101111 |
| 10 | 0A | ID product code (N121IB-L01) | 27 | 00100111 |
| 11 | 0B | ID product code (hex LSB first; N121IB-L01) | 12 | 00010010 |
| 12 | 0C | ID S/N (fixed “0”) | 00 | 00000000 |
| 13 | 0D | ID S/N (fixed “0”) | 00 | 00000000 |



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| | | | | |
|---|---|---|---|---|
| 14 | 0E | ID S/N (fixed “0”) | 00 | 00000000 |
| 15 | 0F | ID S/N (fixed “0”) | 00 | 00000000 |
| 16 | 10 | Week of manufacture (fixed week code) | 1B | 00011011 |
| 17 | 11 | Year of manufacture (fixed year code) | 12 | 00010010 |
| 18 | 12 | EDID structure version # (“1”) | 01 | 00000001 |
| 19 | 13 | EDID revision # (“3”) | 03 | 00000011 |
| 20 | 14 | Video I/P definition (“digital”) | 80 | 10000000 |
| 21 | 15 | Max H image size (“26.112cm”) | 1A | 00011010 |
| 22 | 16 | Max V image size (“16.575cm”) | 11 | 00010001 |
| 23 | 17 | Display Gamma (Gamma = ”2.2”) | 78 | 01111000 |
| 24 | 18 | Feature support (“Active off, RGB Color”) | 0A | 00001010 |
| 25 | 19 | Rx1 Rx0 Ry1 Ry0 Gx1 Gx0 Gy1 Gy0 | 61 | 01100001 |
| 26 | 1A | Bx1 Bx0 By1 By0 Wx1 Wx0 Wy1 Wy0 | C5 | 11000101 |
| 27 | 1B | Rx=0.560 | 8F | 10001111 |
| 28 | 1C | Ry=0.350 | 59 | 01011001 |
| 29 | 1D | Gx=0.340 | 57 | 01010111 |
| 30 | 1E | Gy=0.560 | 8F | 10001111 |
| 31 | 1F | Bx=0.159 | 28 | 00101000 |
| 32 | 20 | By=0.137 | 23 | 00100011 |
| 33 | 21 | Wx=0.313 | 50 | 01010000 |
| 34 | 22 | Wy=0.329 | 54 | 01010100 |
| 35 | 23 | Established timings 1 | 00 | 00000000 |
| 36 | 24 | Established timings 2 | 00 | 00000000 |
| 37 | 25 | Manufacturer’s reserved timings | 00 | 00000000 |
| 38 | 26 | Standard timing ID # 1 | 01 | 00000001 |
| 39 | 27 | Standard timing ID # 1 | 01 | 00000001 |
| 40 | 28 | Standard timing ID # 2 | 01 | 00000001 |
| 41 | 29 | Standard timing ID # 2 | 01 | 00000001 |
| 42 | 2A | Standard timing ID # 3 | 01 | 00000001 |
| 43 | 2B | Standard timing ID # 3 | 01 | 00000001 |
| 44 | 2C | Standard timing ID # 4 | 01 | 00000001 |
| 45 | 2D | Standard timing ID # 4 | 01 | 00000001 |
| 46 | 2E | Standard timing ID # 5 | 01 | 00000001 |
| 47 | 2F | Standard timing ID # 5 | 01 | 00000001 |
| 48 | 30 | Standard timing ID # 6 | 01 | 00000001 |
| 49 | 31 | Standard timing ID # 6 | 01 | 00000001 |
| 50 | 32 | Standard timing ID # 7 | 01 | 00000001 |
| 51 | 33 | Standard timing ID # 7 | 01 | 00000001 |
| 52 | 34 | Standard timing ID # 8 | 01 | 00000001 |
| 53 | 35 | Standard timing ID # 8 | 01 | 00000001 |
| 54 | 36 | Detailed timing description # 1 Pixel clock (“69.4MHz”, According to VESA CVT Rev1.1) | 1B | 00011011 |
| 55 | 37 | # 1 Pixel clock (hex LSB first) | 1B | 00011011 |
| 56 | 38 | # 1 H active (“1280”) | 00 | 00000000 |
| 57 | 39 | # 1 H blank (“132”) | 84 | 10000100 |
| 58 | 3A | # 1 H active : H blank (“1280 : 132”) | 50 | 01010000 |
| 59 | 3B | # 1 V active (”800”) | 20 | 00100000 |



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| | | | | |
|---|---|---|---|---|
| 60 | 3C | # 1 V blank (”19”) | 13 | 00010011 |
| 61 | 3D | # 1 V active : V blank (”800 :19”) | 30 | 00110000 |
| 62 | 3E | # 1 H sync offset (”40”) | 28 | 00101000 |
| 63 | 3F | # 1 H sync pulse width ("26”) | 1A | 00011010 |
| 64 | 40 | # 1 V sync offset : V sync pulse width (”2 : 5”) | 25 | 00100101 |
| 65 | 41 | # 1 H sync offset : H sync pulse width : V sync offset : V sync width (”40: 26 : 2 : 5”) | 00 | 00000000 |
| 66 | 42 | # 1 H image size (”260 mm”) | 04 | 00000100 |
| 67 | 43 | # 1 V image size (”170 mm”) | AA | 10101010 |
| 68 | 44 | # 1 H image size : V image size (”260 : 170”) | 10 | 00010000 |
| 69 | 45 | # 1 H boarder (”0”) | 00 | 00000000 |
| 70 | 46 | # 1 V boarder (”0”) | 00 | 00000000 |
| 71 | 47 | # 1 Non-interlaced, Normal, no stereo, Separate sync, H/V pol Negatives | 18 | 00011000 |
| 72 | 48 | Detailed timing description # 2 | 00 | 00000000 |
| 73 | 49 | # 2 Flag | 00 | 00000000 |
| 74 | 4A | # 2 Reserved | 00 | 00000000 |
| 75 | 4B | # 2 FE (hex) defines ASCII string (Model Name “N121IB-L01”, ASCII) | FE | 11111110 |
| 76 | 4C | # 2 Flag | 00 | 00000000 |
| 77 | 4D | # 2 1st character of name (“N”) | 4E | 01001110 |
| 78 | 4E | # 2 2nd character of name (“1”) | 31 | 00110001 |
| 79 | 4F | # 2 3rd character of name (“2”) | 32 | 00110010 |
| 80 | 50 | # 2 4th character of name (“1”) | 31 | 00110001 |
| 81 | 51 | # 2 5th character of name (“I”) | 49 | 01001001 |
| 82 | 52 | # 2 6th character of name (“B”) | 42 | 01000010 |
| 83 | 53 | # 2 7th character of name (“-”) | 2D | 00101101 |
| 84 | 54 | # 2 8th character of name (“L”) | 4C | 01001100 |
| 85 | 55 | # 2 9th character of name (“0”) | 30 | 00110000 |
| 86 | 56 | # 2 9th character of name (“1”) | 31 | 00110001 |
| 87 | 57 | # 2 New line character indicates end of ASCII string | 0A | 00001010 |
| 88 | 58 | # 2 Padding with “Blank” character | 20 | 00100000 |
| 89 | 59 | # 2 Padding with “Blank” character | 20 | 00100000 |
| 90 | 5A | Detailed timing description # 3 | 00 | 00000000 |
| 91 | 5B | # 3 Flag | 00 | 00000000 |
| 92 | 5C | # 3 Reserved | 00 | 00000000 |
| 93 | 5D | # 3 FE (hex) defines ASCII string (Vendor “CMO”, ASCII) | FE | 11111110 |
| 94 | 5E | # 3 Flag | 00 | 00000000 |
| 95 | 5F | # 3 1st character of string (“C”) | 43 | 01000011 |
| 96 | 60 | # 3 2nd character of string (“M”) | 4D | 01001101 |
| 97 | 61 | # 3 3rd character of string (“O”) | 4F | 01001111 |
| 98 | 62 | # 3 New line character indicates end of ASCII string | 0A | 00001010 |
| 99 | 63 | # 3 Padding with “Blank” character | 20 | 00100000 |
| 100 | 64 | # 3 Padding with “Blank” character | 20 | 00100000 |
| 101 | 65 | # 3 Padding with “Blank” character | 20 | 00100000 |
| 102 | 66 | # 3 Padding with “Blank” character | 20 | 00100000 |
| 103 | 67 | # 3 Padding with “Blank” character | 20 | 00100000 |
| 104 | 68 | # 3 Padding with “Blank” character | 20 | 00100000 |
| 105 | 69 | # 3 Padding with “Blank” character | 20 | 00100000 |
| 106 | 6A | # 3 Padding with “Blank” character | 20 | 00100000 |



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| | | | | |
|---|---|---|---|---|
| 107 | 6B | # 3 Padding with “Blank” character | 20 | 00100000 |
| 108 | 6C | Detailed timing description # 4 | 00 | 00000000 |
| 109 | 6D | # 4 Flag | 00 | 00000000 |
| 110 | 6E | # 4 Reserved | 00 | 00000000 |
| 111 | 6F | # 4 FE (hex) defines ASCII string (Model Name“N121IB-L01”, ASCII) | FE | 11111110 |
| 112 | 70 | # 4 Flag | 00 | 00000000 |
| 113 | 71 | # 4 1st character of name (“N”) | 4E | 01001110 |
| 114 | 72 | # 4 2nd character of name (“1”) | 31 | 00110001 |
| 115 | 73 | # 4 3rd character of name (“2”) | 32 | 00110010 |
| 116 | 74 | # 4 4th character of name (“1”) | 31 | 00110001 |
| 117 | 75 | # 4 5th character of name (“I”) | 49 | 01001001 |
| 118 | 76 | # 4 6th character of name (“B”) | 42 | 01000010 |
| 119 | 77 | # 4 7th character of name (“-”) | 2D | 00101101 |
| 120 | 78 | # 4 8th character of name (“L”) | 4C | 01001100 |
| 121 | 79 | # 4 9th character of name (“0”) | 30 | 00110000 |
| 122 | 7A | # 4 9th character of name (“1”) | 31 | 00110001 |
| 123 | 7B | # 4 New line character indicates end of ASCII string | 0A | 00001010 |
| 124 | 7C | # 4 Padding with “Blank” character | 20 | 00100000 |
| 125 | 7D | # 4 Padding with “Blank” character | 20 | 00100000 |
| 126 | 7E | Extension flag | 00 | 00000000 |
| 127 | 7F | Checksum | F1 | 11110001 |

## 6. CONVERTER SPECIFICATION

### 6.1 CONVERTER INPUT CONNECTOR PIN ASSIGNMENT

| Pin | Symbol | Description |
|---|---|---|
| 1 | Reserved | Reserved |
| 2 | PWM | PWM control pin for dimming brightness |
| 3 | EN | H: backlight on L: backlight off. |
| 4 | Gnd | Ground |
| 5 | Gnd | Ground |
| 6 | Vin | Power supply pin |
| 7 | Vin | Power supply pin |

Note(1) Connector Part No: Aces 87213 or equivalent

### 6.2 ABSOLUTE MAXIMUM RATINGS

| Symbol | Ratings |
|---|---|
| Vin | 40.0V |
| Gnd | +/-0.3V |
| PWM, EN | -0.3V~6.0V |



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## 6.3 RECOMMENDED OPERATING RATINGS

| Parameter | | Symbol | Value | | | Unit | Note |
|---|---|---|---|---|---|---|---|
| | | | Min. | Typ. | Max. | | |
| Converter Input Power Supply Voltage | | $V_{in}$ | 8.0 | 12.0 | 21.0 | V | |
| EN Control Level | Backlight on | | 2.0 | --- | 5.5 | V | |
| | Backlight off | | 0 | --- | 0.8 | V | |
| PWM Control Level | PWM High Level | | 2.0 | --- | 5.5 | V | |
| | PWM Low Level | | 0 | --- | 0.8 | V | |
| PWM Control Duty Ratio | | | (20) | | 100 | % | |
| PWM Control Frequency | | $f_{PWM}$ | (190) | (210) | (230) | Hz | |
| Converter Input Current | Vin=8V | $I_{BL}$ | - | - | 447 | mA | (1) |
| | Vin=21V | | - | - | 170 | mA | (2) |

Note (1) The specified LED power supply current is under the conditions at Vin = 6V, Ta = 25 ± 2 ºC, $f_{PWM}$ = 200 Hz, Duty=100%.

Note (2) The specified LED power supply current is under the conditions at Vin = 21V, Ta = 25 ± 2 ºC, $f_{PWM}$ = 200 Hz, Duty=100%.

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# 6 INTERFACE TIMING

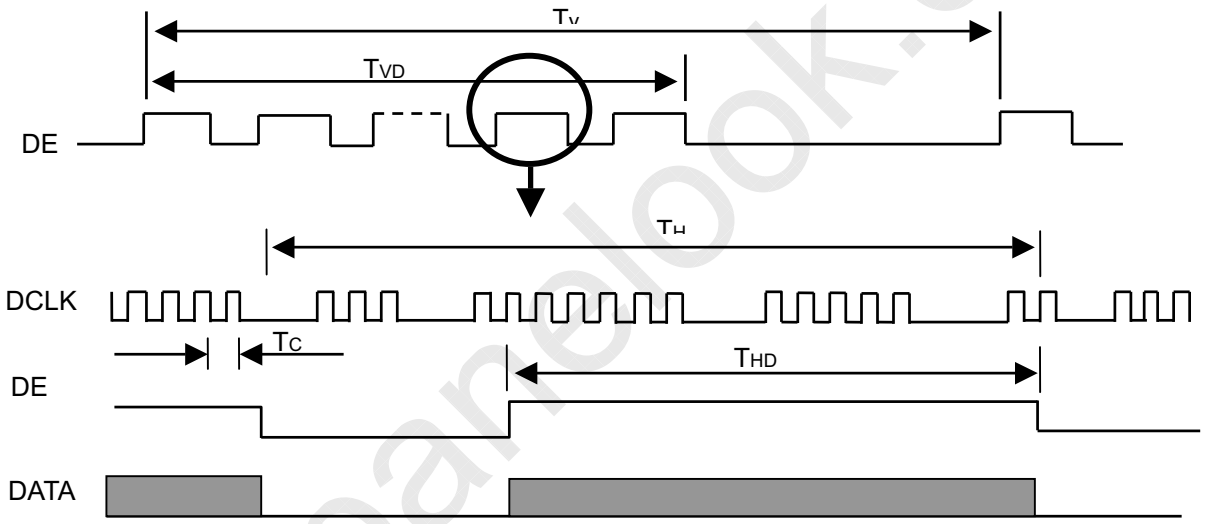
## 7.1 INPUT SIGNAL TIMING SPECIFICATIONS

The input signal timing specifications are shown as the following table and timing diagram.

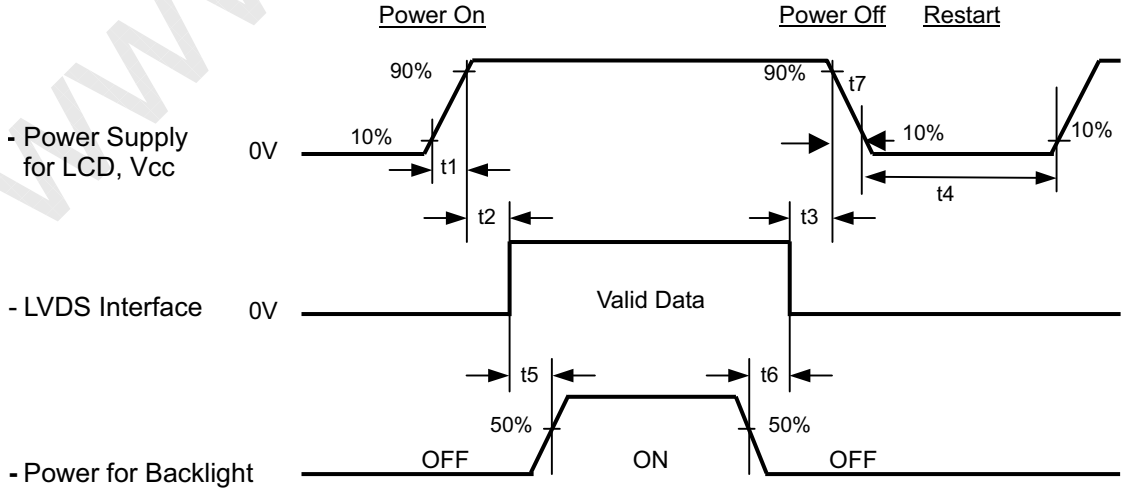
| Signal | Item | Symbol | Min. | Typ. | Max. | Unit | Note |
|---|---|---|---|---|---|---|---|
| DCLK | Frequency | 1/Tc | 67.45 | 71 | 74.55 | MHz | - |
| DE | Vertical Total Time | TV | 802 | 823 | 1023 | TH | - |
| | Vertical Active Display Period | TVD | 800 | 800 | 800 | TH | - |
| | Vertical Active Blanking Period | TVB | TV-TVD | 23 | TV-TVD | TH | |
| | Horizontal Total Time | TH | 1380 | 1440 | 1600 | Tc | - |
| | Horizontal Active Display Period | THD | 1280 | 1280 | 1280 | Tc | - |
| | Horizontal Active Blanking Period | THB | TH-THD | 160 | TH-THD | Tc | |

Note (1) Because this module is operated by DE only mode, Hsync and Vsync are ignored

**INPUT SIGNAL TIMING DIAGRAM**




## 7.2 POWER ON/OFF SEQUENCE



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Timing Specifications:

0.5 ≦ t1 ≦ 10 ms

0 ≦ t2 ≦ 50 ms

0 ≦ t3 ≦ 50 ms

t4 ≧ 500 ms

t5 ≧ 200 ms

t6 ≧ 200 ms

Note (1) Please follow the power on/off sequence described above. Otherwise, the LCD module might be damaged.

Note (2) Please avoid floating state of interface signal at invalid period. When the interface signal is invalid, be sure to pull down the power supply of LCD Vcc to 0 V.

Note (3) The Backlight converter power must be turned on after the power supply for the logic and the interface signal is valid. The Backlight converter power must be turned off before the power supply for the logic and the interface signal is invalid.

Note (4) Sometimes some slight noise shows when LCD is turned off (even backlight is already off). To avoid this phenomenon, we suggest that the Vcc falling time is better to follow (1ms)≦t7≦300 ms.

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# 7 OPTICAL CHARACTERISTICS

## 8.1 TEST CONDITIONS

| Item | Symbol | Value | Unit |
|---|---|---|---|
| Ambient Temperature | Ta | 25±2 | °C |
| Ambient Humidity | Ha | 50±10 | %RH |
| Supply Voltage | $V_{CC}$ | 3.3 | V |
| Input Signal | According to typical value in "3. ELECTRICAL CHARACTERISTICS" | | |
| LED Light Bar Input Current | $I_L$ | 105 | mA |

The measurement methods of optical characteristics are shown in Section 8.2. The following items should be measured under the test conditions described in Section 8.1 and stable environment shown in Note (6).

## 8.2 OPTICAL SPECIFICATIONS

| Item | | Symbol | Condition | Min. | Typ. | Max. | Unit | Note |
|---|---|---|---|---|---|---|---|---|
| Contrast Ratio | | CR | $\theta_x$=0°, $\theta_Y$ =0° Viewing Normal Angle | 300 | 500 | - | - | (2), (5) |
| Response Time | | $T_R$ | | - | 3 | 8 | ms | (3) |
| | | $T_F$ | | - | 7 | 12 | ms | |
| Luminance of White (5P) | | $L_{AVE}$ | | 180 | 220 | - | cd/m$^2$ | (4), (5) |
| White Variation | | δW | | - | - | 1.40 | - | (5), (6) |
| Color Chromaticity | Red | Rx | | Typ.-0.05 | 0.560 | Typ.+0.05 | - | (1), (5) |
| | | Ry | | | 0.350 | | - | |
| | Green | Gx | | | 0.340 | | - | |
| | | Gy | | | 0.560 | | - | |
| | Blue | Bx | | | 0.159 | | - | |
| | | By | | | 0.137 | | - | |
| | White | Wx | | | 0.313 | | - | |
| | | Wy | | | 0.329 | | - | |
| Viewing Angle | Horizontal | $\theta_x$+ | CR≥10 | 40 | 45 | - | Deg. | (1), (5) |
| | | $\theta_x$- | | 40 | 45 | - | | |
| | Vertical | $\theta_Y$+ | | 15 | 20 | - | | |
| | | $\theta_Y$- | | 40 | 45 | - | | |

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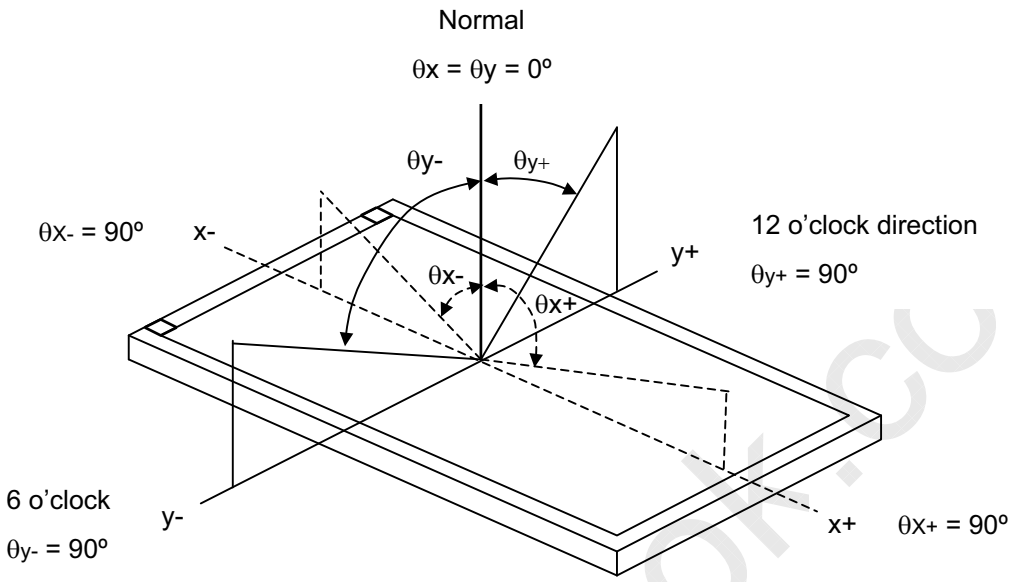
Note (1) Definition of Viewing Angle (θx, θy):




Note (2) Definition of Contrast Ratio (CR):

The contrast ratio can be calculated by the following expression.

Contrast Ratio (CR) = L63 / L0

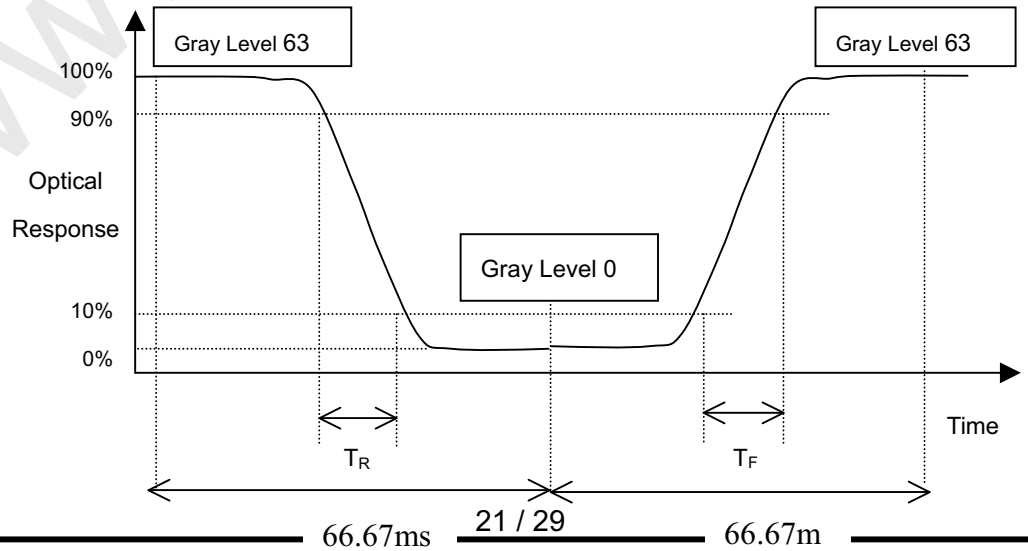
L63: Luminance of gray level 63

L 0: Luminance of gray level 0

CR = CR (5)

CR (X) is corresponding to the Contrast Ratio of the point X at Figure in Note (6).

Note (3) Definition of Response Time ($T_R$, $T_F$):



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Note (4) Definition of Average Luminance of White ($L_{AVE}$):

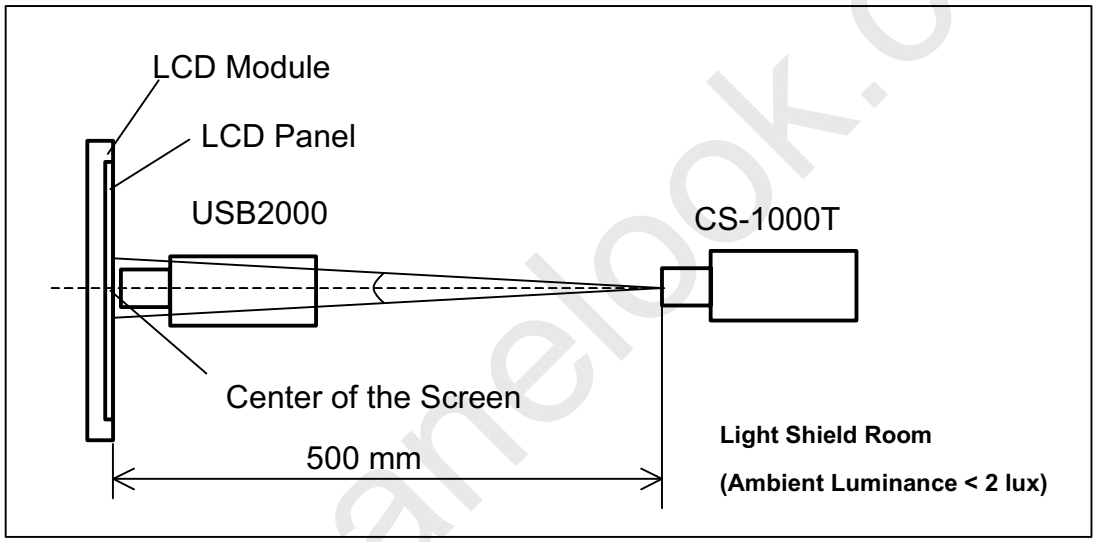
Measure the luminance of gray level 63 at 5 points

$L_{AVE}$ = [L (1)+ L (2)+ L (3)+ L (4)+ L (5)] / 5

L (x) is corresponding to the luminance of the point X at Figure in Note (6).

Note (5) Measurement Setup:

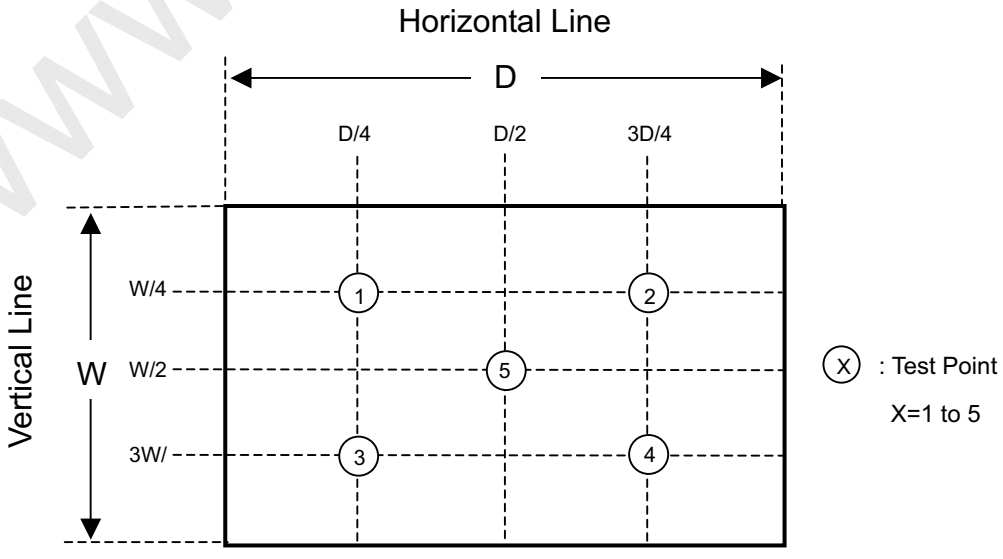
The LCD module should be stabilized at given temperature for 15 minutes to avoid abrupt temperature change during measuring. In order to stabilize the luminance, the measurement should be executed after lighting Backlight for 15 minutes in a windless room.




Note (6) Definition of White Variation (δW):

Measure the luminance of gray level 63 at 5 points

δW = Maximum [L (1), L (2), L (3), L (4), L (5)] / Minimum [L (1), L (2), L (3), L (4), L (5)]



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# 9 PRECAUTIONS

## 9.1 HANDLING PRECAUTIONS

(1) The module should be assembled into the system firmly by using every mounting hole. Be careful not to twist or bend the module.

(2) While assembling or installing modules, it can only be in the clean area. The dust and oil may cause electrical short or damage the polarizer.

(3) Use fingerstalls or soft gloves in order to keep display clean during the incoming inspection and assembly process.

(4) Do not press or scratch the surface harder than a HB pencil lead on the panel because the polarizer is very soft and easily scratched.

(5) If the surface of the polarizer is dirty, please clean it by some absorbent cotton or soft cloth. Do not use Ketone type materials (ex. Acetone), Ethyl alcohol, Toluene, Ethyl acid or Methyl chloride. It might permanently damage the polarizer due to chemical reaction.

(6) Wipe off water droplets or oil immediately. Staining and discoloration may occur if they left on panel for a long time.

(7) If the liquid crystal material leaks from the panel, it should be kept away from the eyes or mouth. In case of contacting with hands, legs or clothes, it must be washed away thoroughly with soap.

(8) Protect the module from static electricity, it may cause damage to the C-MOS Gate Array IC.

(9) Do not disassemble the module.

(10) Do not pull or fold the lamp wire.

(11) Pins of I/F connector should not be touched directly with bare hands.

## 9.2 STORAGE PRECAUTIONS

(1) High temperature or humidity may reduce the performance of module. Please store LCD module within the specified storage conditions.

(2) It is dangerous that moisture come into or contacted the LCD module, because the moisture may damage LCD module when it is operating.

(3) It may reduce the display quality if the ambient temperature is lower than 10 ºC. For example, the response time will become slowly, and the starting voltage of lamp will be higher than the room temperature.

## 9.3 OPERATION PRECAUTIONS

(1) Do not pull the I/F connector in or out while the module is operating.

(2) Always follow the correct power on/off sequence when LCD module is connecting and operating. This can prevent the CMOS LSI chips from damage during latch-up.

(3) The startup voltage of Backlight is approximately 1000 Volts. It may cause electrical shock while assembling with converter. Do not disassemble the module or insert anything into the Backlight unit.



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# 10 PACKING

## 10.1 CARTON

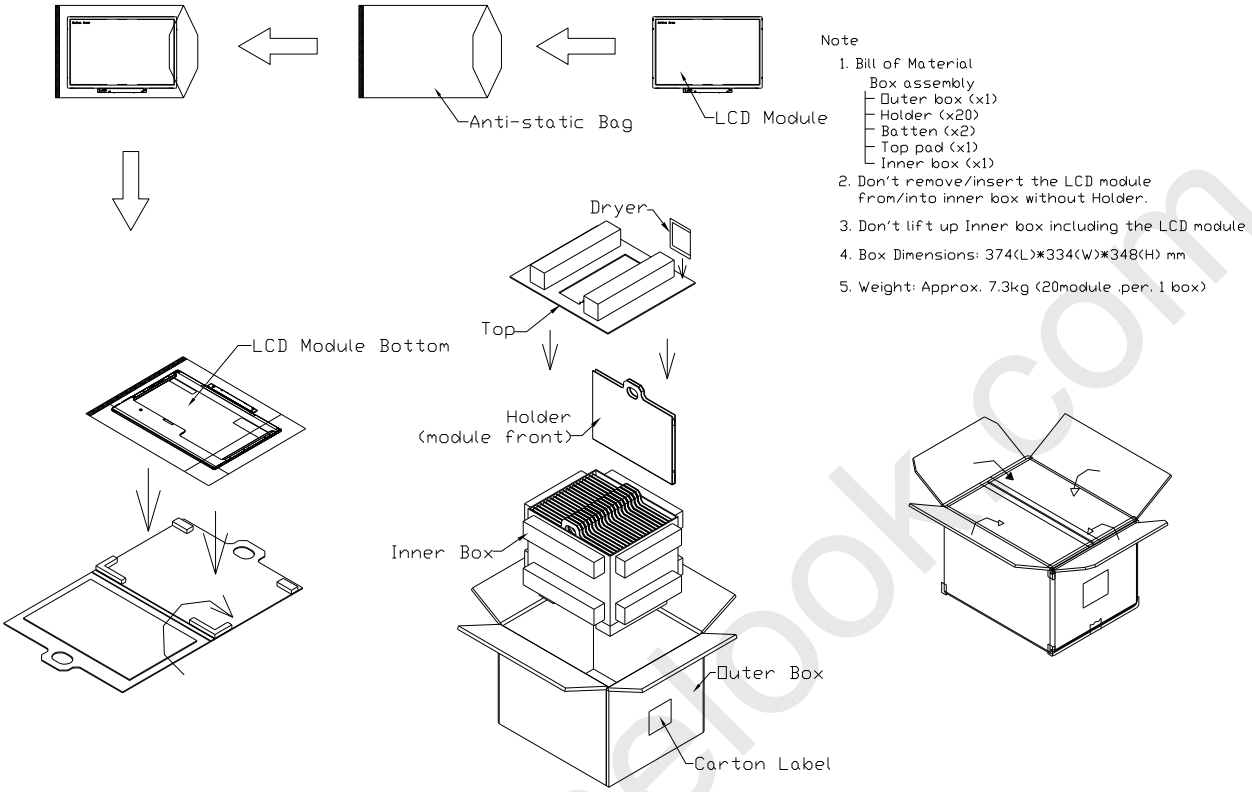


**Figure. 10-1 Packing method**



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10.2 PALLET

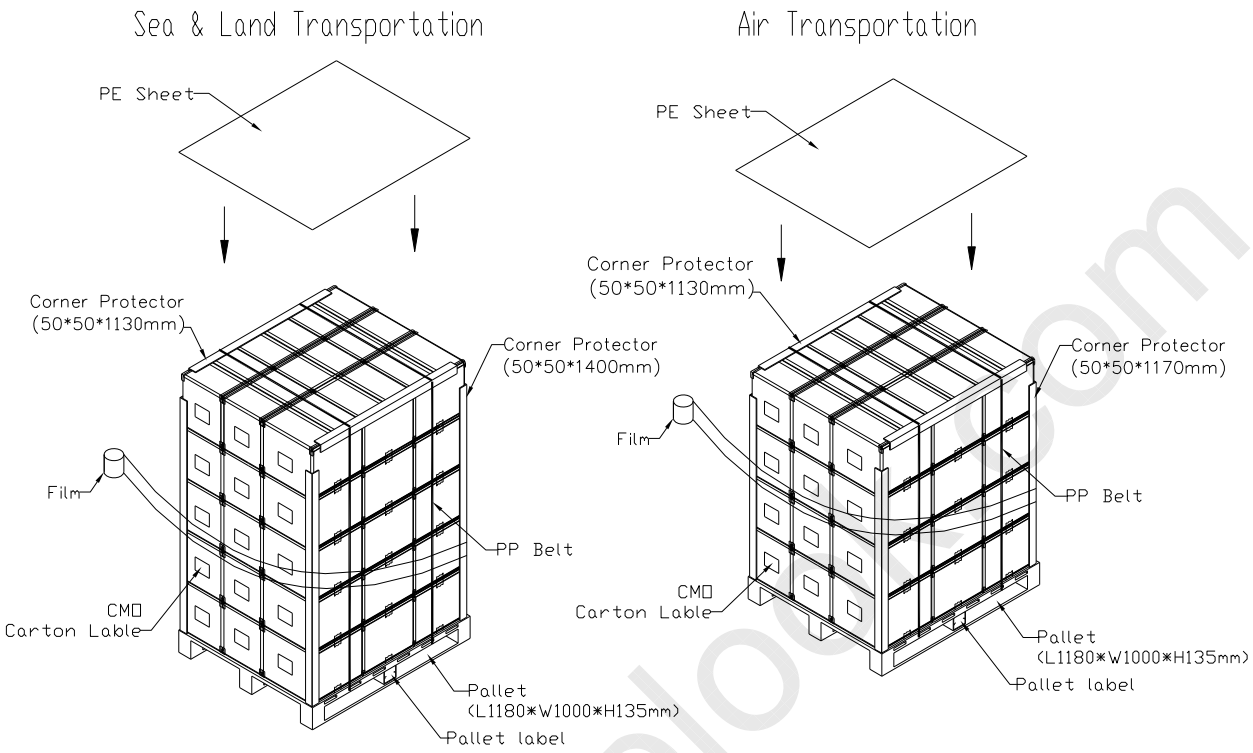


**Figure. 10-2 Packing method**

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# 11 DEFINITION OF LABELS

## 11.1 CMO MODULE LABEL

The barcode nameplate is pasted on each module as illustration, and its definitions are as following explanation.

(a) Model Name: N121IB - L01

(b) Revision: Rev. XX, for example: C1, C2 …etc.

(c) Serial ID: X X X X X X Y M D X N N N N

- Serial No.
- CMO Internal Use
- Year, Month, Date
- CMO Internal Use
- Revision
- CMO Internal Use

(d) Production Location: MADE IN XXXX. XXXX stands for production location.

(e) UL/CB logo: "LEOO" especially stands for panel manufactured by CMO Ningbo satisfying UL/CB requirement. "LEOO" is the CMO's UL factory code for Ningbo factory.

Serial ID includes the information as below:

(a) Manufactured Date: Year: 1~9, for 2001~2009

Month: 1~9, A~C, for Jan. ~ Dec.

Day: 1~9, A~Y, for 1st to 31st, exclude I , O and U

(b) Revision Code: cover all the change

(c) Serial No.: Manufacturing sequence of production

CT Label

| S/N | CT:CABXTXXVRXXXXX |
|---|---|
| CT: | Title |
| C | LCD Display Module |
| ABXT | Assembly Code |
| XX | Revision |
| VR | Supplier /Site of MFG |
| XX | Week/Year of MFG |
| XXX | Serial number. From 000000 to 999999 |



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11.2 CARTON LABEL

(a) Production location: Made in XXXX. XXXX stands for production location.

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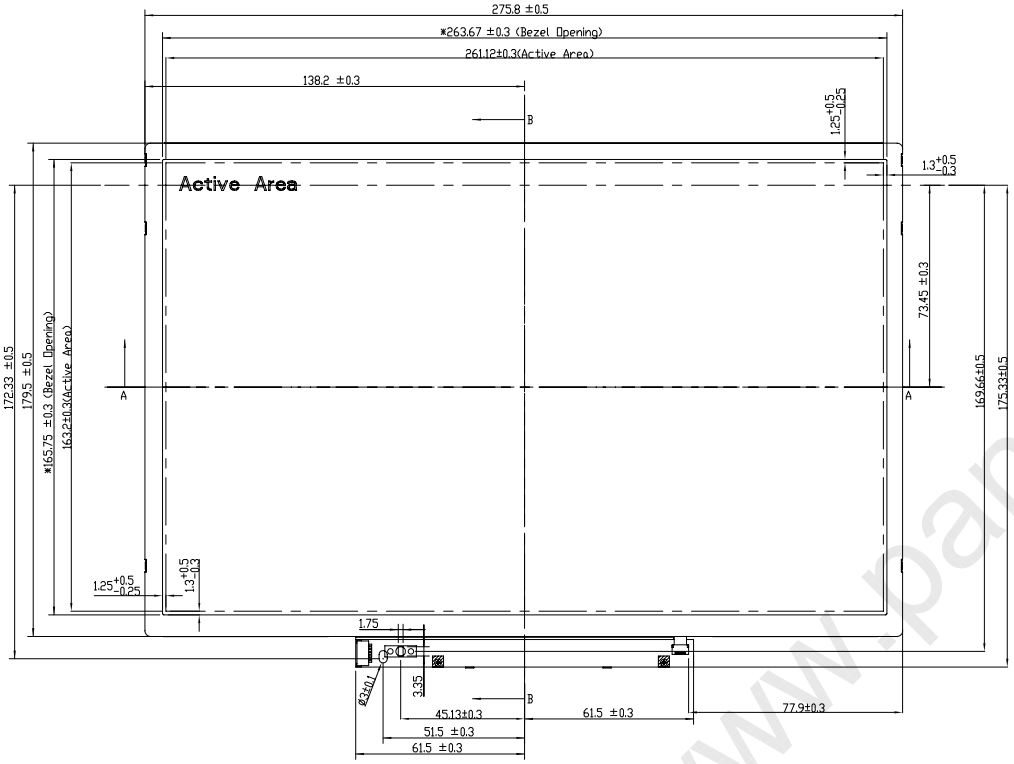
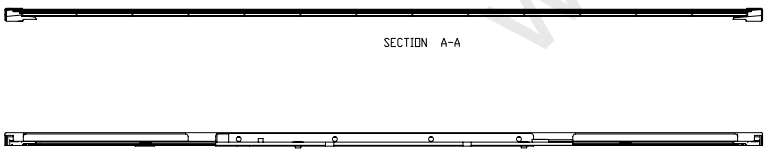
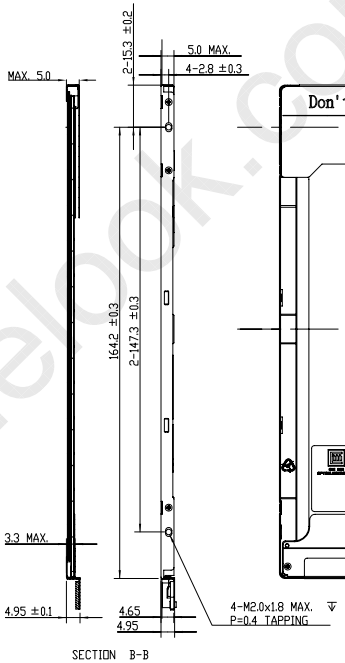
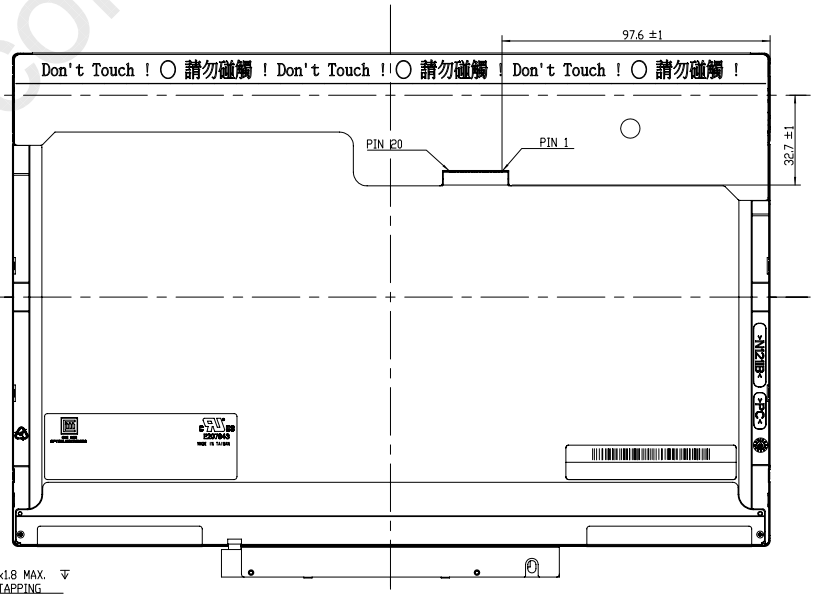



SECTION A-A






SECTION B-B




NOTES:
1."*" MARKS THE DESIGN CRITICAL DIMENSION.
2." Ⓟ" MARKS THE PROCESS CRITICAL DIMENSION.
3.MAX.SCREW LENGTH: 1.8 mm.
4.MAX.SCREW TORQUE: 2.0 kgf-cm.
5.SIGNAL INTERFACE CONNECTOR: DF19KR-20P-1H (HIROSE).
6.INPUT CONNECTOR TYPE: ACES 87213(orJST SM07B-SRSS-TB)
7.GAP BETWEEN BEZEL AND PANEL: MAX. 0.5mm

| Mark | Description | Date | Changed_By | Approved_By | ECN No. | Remark |
|---|---|---|---|---|---|---|
| | | | | | | |

| TITLE | OUTLINE DRAWING N121IB-L01 | | | 2D REV. | 1 |
|---|---|---|---|---|---|
| | | | | 3D REV. | |
| Approved | BILL SHEU | Drawing No. | N121IB41011 | | |
| Checked | SHUNNAN | Part No. | TBD | | |
| Drawer | Kengshun Lin | Material | TBD | Sheet | 1 / 1 A1 |
| Designer | Kengshun Lin | Date | 04-Oct-2007 | Scale 1/1 | Unit:mm |

| General Tolerance Unless Specified | | | |
|---|---|---|---|
| 0-6 | ±0.1 | 300-600 | ±0.3 |
| 6-30 | ±0.15 | 600- | ±0.6 |
| 30-300 | ±0.2 | ANGLE | ±1.0° |

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